REMARKS

Claims 1-4, 7-24, 29-30, 32-40 are all the claims pending in the application. Claims 6, 25-28, and 31, have been canceled without prejudice or disclaimer. New claim 40 has been added to further define the invention. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claims 1-4 and 6-39 under §103(a) as being unpatentable over US Patent 6,161,962 to French (hereinafter French). Applicants respectfully traverse this rejection because French fails to teach or suggest all the elements as set forth in the claims.

With respect to claim 1, French does not teach a material of shank 104. On the other hand, as set forth in claim 1, a case 34 is made of non-magnetic metal, so that the rotation detecting sensor is not influenced by an external magnetic flux, and so that the strength of the sensor unit is enhanced. Please note the specification at page 26 lines 1-9.

That is, one embodiment has both strength and detecting accuracy regarding wheel rotation, wherein the detection device has a rotation sensor ("first sensor" as recited in claim 1), and a multi-sensor ("at least one second sensor" as recited in claim 1) for detecting a condition of the rolling bearing unit.

Accordingly, independent claim 1 is not rendered obvious by French. Likewise, dependent claims 2-4, 7-9, 12-15, 18, and 21-24, are not rendered obvious by this reference.

Independent claim 29 sets forth a vibration sensor that has a function of detecting vibrations in a plurality of directions. On the contrary, French does not teach or suggest a vibration sensor that detects vibrations in two or more directions. Accordingly, claim 29 is not rendered obvious by French. Likewise, dependent claims 9-11 are not rendered obvious by this reference.

Claim 30 sets forth an acceleration sensor that has a function of detecting acceleration in a plurality of directions. On the contrary, French does not teach or suggest an acceleration sensor that detects accelerations in two or more directions. Accordingly, claim 30 is not

rendered obvious by French. Likewise, dependent claim 32 is not rendered obvious by this reference.

With respect to independent claim 33, French fails to teach or suggest an abnormality determination circuit as claimed. French only discloses that a module sensor has a rotation speed sensor, a vibration sensor, and a temperature sensor, etc., when both the physical property and the operation condition of the rolling bearing are detected. French then determines that the bearing should be removed from service when the acceleration sensor 114 detects a higher amount of vibrations than does a similar acceleration sensor in a neighboring bearing, or when it detects an increasing amount of vibrations as compared to its historical readings. See, for example, col. 7, line 63 - col. 8, line 18. Accordingly, French does not teach or suggest an abnormality determination circuit which judges the presence or absence of abnormality in accordance with a signal from the vibration sensor (second sensor as recited in claim 33, as a signal therefrom is received through the period analysis circuit) and a signal representing the rotation speed as detected by the rotation sensor (first sensor as recited in claim 33). Accordingly, the invention as set forth in claim 33 can judge whether an abnormality is present or not in the rolling bearing unit from the rotation speed and from the vibration of the rolling bearing.

Further, because of the manner in which the abnormality is detected in claim 33, not only can it be checked whether damage due to the flaking has occurred or not in the rolling bearing unit, but also it is possible to specify the portion of the rolling bearing unit where the flaking has occurred. Please see the specification at page 39 line 10 - page 40 line 21.

Specifically, for example, when a vibration component having frequencies other than the frequencies f1, f2, f3—respectively corresponding to the respective periods T1, T2, T3—increases, the presence of an abnormality (for example, localized wear has occurred in a single portion of the wheel or tire due to the traveling of the car) can be detected in a portion other than a contact portion of the rolling bearing unit. Please see the specification at page 42 line 18 - page 43 line 9.

Thus, the presently claimed invention as set forth in claim 33 has an advantage over French, because that reference does not teach or suggest a purpose or means to detect in which portion (inner ring, outer ring, and rolling element in the rolling bearing) flaking occurs.

With respect to claim 34, in addition to that noted above for claim 33, because it includes both a frequency analysis circuit and an abnormality determination circuit, the precision of the analysis is increased. Please see the specification at page 42 lines 4 - 17. Therefore, claim 34 is further distinguishable over French.

With respect to claim 36, French fails to teach or suggest an encoder that is magnetized along a circumferential direction thereof, including S and N poles and non-magnetized areas disposed on a peripheral surface thereof so as to repeat one another at regular intervals.

In the related art, two rotation sensor are required when both the rotation speed and the rotation direction is to be detected. On the other hand, according to that set forth in claim 36, both the rotation speed and the rotation direction can be detected by only one rotation sensor due to the magnetizing pattern in which S poles, N poles, and non-magnetized areas, are arranged.

Therefore, claim 36 is distinguishable over French which, similar to the related art, teaches only S and N poles alternately arranged. See, for example, col. 6, lines 49-62..

Claim 37 sets forth a threshold value setting circuit that sets a threshold value in accordance with the rotation speed of the rotary ring as detected by said rotation detecting sensor so as to increase the threshold value as the detected rotation speed increases. Thus, the presently claimed invention as set forth in claim 37 changes threshold value in order to detect an abnormality on the basis of a value of the rotation sensor (first sensor as recited in claim 37).

To the contrary, French only discloses that a module sensor has a rotation speed sensor, a vibration sensor and a temperature sensor etc. when both the physical property and the operation condition of the rolling bearing are detected. But French does not teach or suggest a threshold value setting circuit, as set forth in claim 37, i.e., one which changes a threshold according to the rotation speed as detected by the rotation sensor, wherein the threshold is one with which a signal from a second sensor is compared to detect an abnormality. Therefore, the invention as set forth in claim 37 can detect the abnormality of the rolling bearing unit which occurs not only in a high speed rotation time but also low speed rotation time.

In light of the above, French fails to render obvious independent claims 1, 29, 30, 33, 34, 36, and 37. Likewise, this reference fails to render obvious dependent claims 2-4, 6-24, 32, and 35.

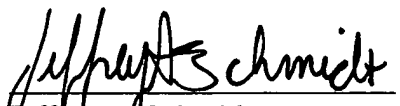
Conclusion

New claim 40 has been added to further define the invention. The subject matter of claim 40 corresponds to that set forth in claim 5, which previously was canceled. Claim 40 depends from claim 1 and, therefore, should be allowable at least for the same reasons as set forth above with respect to claim 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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